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STUDY OF DISTANCE ASSOCIATED WITH MARRIAGE MIGRATION

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ABSTRACT

Majority of migration studies have discussed movement of individuals in the context of economic reasons, mainly for a job outside the place of origin. Another type of movement especially of females occurs which involves a change of usual place of residence is called marriage migration. In this paper we have tried to explain the pattern of marriage migration as a function of distance and findings show that weibull distribution is helpful in modeling the phenomena.

KEYWORDS: Marriage Migration, Pareto-Exponential, Weibull Distribution, MLE

INTRODUCTION

The Migration pattern varies from society to society with the change in social norms and customs. Majority of migration studies have discussed movement of individuals in the context of economic reasons, mainly for a job outside the place of origin[2] . However, another type of movement especially of females occurs which involves a change of usual place of residence. This type of migration is usually caused by the marriage of females in developing countries like India and is called as 'marriage migration'.

In India, female migration caused by marriage in rural areas is mostly from rural to rural, at short distances and only few are from rural to urban. Marriage migration is effected significantly by the social rules associated with marriage e.g. in a society where village 'endogamy' is common, there may not be many 'marriage migration'. In India where Migration of men is usually occurs because of work, life time migration is almost universal among women because of marriage. It is almost a universal tradition for brides to move to bridegroom's home after marriage. This type of migration is balanced in the sense that the 'out migration' due to marriage from a village is more or less same as the 'in migration'. Thus, in case of marriage migration the population size of the village/area remains unchanged. This may be one of the main causes that the pattern of the distribution associated with marriage migration has rarely been analysed. Lack of pertinent data as well as lack of interest among social scientists may be another important cause. However, a number of researchers have discussed the pattern of marriage migration as a function of distance[3, 5, 6, 11].

The aim of this paper is to study the pattern of distance associated with marriage migration through some probability models.

Model-I

To describe the relationship between marriage distance and migration, Morril and Pits[5] gave a model as follows:

$$Y = aD^{-b} \tag{1}$$

Where Y is the number of marriages at distance 'D', which is a Pareto function. Since, like the gravity model, Pareto function tends to overestimate close-in-frequencies, they modified the model as follows:

$$Y = ae^{-bD} \tag{2}$$

Which is an exponential model. They argued that this model is suited to data in which successive moves or contacts are in fact correlated in length and direction.

Further, they suggested another model as:

$$Y = ae^{-(b\log D)^2} \tag{3}$$

Which is a Log-normal function and mentioned that this model is well suited to data with a multiplicative element, such as repeated trips over the same path. However, both Exponential and Log-normal functions tend to under estimate the close-in frequencies, though a lot of empirical data sets have been fitted successfully to this distribution.

To avoid the difficulty of overestimate and under estimate of close-in-frequencies, Morril and Pits joined the Pareto and Exponential functions with gravitational concept and proposed another model known as Pareto-Exponential function. After applying the model to several sets of data, the Pareto-Exponential function was found to be superior to either of the functions separately, but this was not always true. They further mentioned that this model is suitable for the movements combining the notions of accidental and purposeful behaviour. Mainly the models to describe the distribution of distance associated with marriage migration are based on the assumption that the number of marriages is a decaying function of distance, i.e. as distance increases the number of marriages decreases.

The Pareto-Exponential model proposed by Morril and Pits seems to suit for such a situation and may describe the marriage distance reasonably well and the function is written as follows:

$$Y = aD^{-b}e^{-cD} \tag{4}$$

Where Y is the number of marriage, D is the distance associated with marriage migration, a, b, & c are the parameters. Taking logarithms in both sides of equation (4), it becomes as

$$Log_e Y = Log_e a - bLog_e D - cD \tag{5}$$

Using least-squares method, parameters a, b and c can be easily estimated.

MODEL-II

Let D be a random variable denoting the distance associated with marriage migration of a woman, naturally it takes only non-negative values. When this distance is increasing the chance of getting appropriate male partner is increasing thus we can say the chance of getting marriage is also increasing. Thus in this situation for the modelling purpose we may think any distribution whose hazard is increasing, therefore in the present study, we consider a hazard rate which is given by:

$$h(D;\alpha,\beta,\gamma) = \frac{\beta}{\alpha}\left(\frac{D-\gamma}{\alpha}\right)^{\beta-1}, \ where \ \alpha,\beta > 0, \ \ 0 < \gamma \le D < \infty \tag{6}$$

It is easily shown that $h(D)$ is increasing if $\beta > 1,$ decreasing if $\beta < 1,$ and is constant if $\beta = 1$. Since, β controls the shape of the distribution so it is called the shape parameter, while γ and α are usually referred to as the location and scale parameters. The probability density function for the above mentioned hazard rate is defined as

$f(x) = h(x)\exp\left\{-\int_0^x h(w)dw\right\}$, then after simplification, the corresponding p.d.f. may be given as follows,

$$f(D) = \left(\frac{\beta}{\alpha}\right)\left(\frac{D-\gamma}{\alpha}\right)^{\beta-1} e^{-\left(\frac{D-\gamma}{\alpha}\right)^{\beta}} \text{ , where } D \geq \gamma \tag{7}$$

This is the p.d.f. of three-parameter Weibull distribution and may be a suitable model for the migration distance associated with marriage. Here, the distance propensity associated marriage migration is represented by α and β is referred to as shape of pattern of distance associated marriage migration. The location parameter γ gives the idea about the threshold value i.e. minimum distance associated to marriage migration.

ESTIMATION

For applying the above proposed distribution we need to obtain the values of its parameters. Thus, the parameters α, β and γ are obtained by using maximum likelihood estimation method. The method of maximum likelihood[1] is the frequently used procedure because it has very desirable properties. Let $D_{1,}D_2,\ldots\ldots\ldots, D_n$ be a random sample of size n drawn from a probability density function $f(D;\alpha,\beta,\gamma)$ where α, β and γ are unknown parameters. The likelihood function of this random sample is the joint density of the n random variables and is a function of the unknown parameter. Thus**,** the likelihood function can be expressed as,

$$L(\alpha,\beta,\gamma) = \prod_{i=1}^{n} f(D_i;\alpha,\beta,\gamma) \tag{8}$$

$$L(\alpha,\beta,\gamma) = \frac{\beta^n}{\alpha^{\beta n}}\left[\prod_{i=1}^{n}(D_i-\gamma)^{\beta-1}\right] e^{-\frac{1}{\alpha^{\beta}}\sum_{i=1}^{n}(D_i-\gamma)^{\beta}} \tag{9}$$

The maximum likelihood estimator of the parameter is the value of the parameter that maximizes the likelihood function, L and maximum likelihood function to estimate the Weibull parameter, namely the scale, shape and location parameters. This can be obtained by solving the equations resulting from setting the three partial derivatives of $L(\alpha, \beta, \gamma)$ with respect to α, β and γ to zero and then solving the following set of equations simultaneously, for getting the estimate of the parameters .

$$\left(\hat{\alpha}\right)^{\hat{\beta}} - \frac{1}{n}\sum_{i=1}^{n}\left(D_i - \hat{\gamma}\right)^{\hat{\beta}} = 0 \tag{10}$$

$$\frac{\sum_{i=1}^{n}\left(D_i-\hat{\gamma}\right)^{\hat{\beta}}\ln\left(D_i-\hat{\gamma}\right)}{\sum_{i=1}^{n}\left(D_i-\hat{\gamma}\right)^{\hat{\beta}}}-\frac{1}{\hat{\beta}}-\frac{1}{n}\sum_{i=1}^{n}\ln\left(D_i-\hat{\gamma}\right)=0 \tag{11}$$

$$\left(\hat{\beta}-1\right)\sum_{i=1}^{n}\left(D_i-\hat{\gamma}\right)^{-1}-\hat{\beta}\hat{\alpha}^{-\hat{\beta}}\sum_{i=1}^{n}\left(D_i-\hat{\gamma}\right)^{\hat{\beta}-1}=0 \tag{12}$$

The above equation can be solved by using an iterative technique. Marks[4] suggested that the mle of three-parameter Weibull distribution requires simultaneous solution of complex equations that can be solved by using an iterative numerical method such as the Newton-Raphson algorithm.

DISCUSSIONS AND CONCLUSIONS

To check the suitability of both models i.e., Pareto exponential and three parameter weibull model, a real data set from "Migration and Related Characteristics-a Case Study of North-Eastern Bihar", has been used[8]. This area is still lacking on many parameters of the demographic and economic conditions[9]. The study was mainly conducted to know the migration situation of the area and some probability models are also proposed or modified according to migration pattern based on this study[7, 10].

After getting the estimates of α, β, and γ from three-parameter weibull distribution, the observed and expected frequencies of females according to distance associated marriage migration are calculated by using equation (12) and these are given in Table 2. The estimates of Pareto exponential model is given in table 1.

The table reveals that the values of chi-square statistic are significant at 5% level of significance in older and younger cohort of women as well as in total as a whole, and hence, show the suitability of the proposed model. Thus, the three-parameter Weibull distribution describes the pattern of distance associated marriage migration in older, younger and in total as a whole having a significant variation over time. Table 2 shows that the threshold values (γ) i.e. theoretical value of starting point of distance associated marriage migration is 1.66. It indicates that the distance associated marriage migration doesn't less than 1.66 kilometres. The intensity or propensity of distance associated with marriage migration (α) is 28.848. The tables reveal that the proposed model describes the data satisfactorily well.

Table 1: Distribution of Observed and Expected Number of Marriages According to Distance (Moril Pits Model)

Distance	Observed	Expected
0-5	17	17.38
5-10	75	70.58
10-15	98	107.74
15-20	120	123.05
20-25	129	121.95
25-30	116	111.10
30-35	100	95.70
35-40	74	79.22
40-45	63	63.65
45-50	53	49.96

Table 1: Contd.,		
50-55	34	38.50
55-60	23	29.22
60-65	28	21.90
Total	**930**	**930**
A		4.656574
B		-1.66438
C		0.08544
Chi-square		6.142473

Table 2: Distribution of Observed and Expected Number of Marriages According to Distance (Proposed Model)

Distance	Observed	Expected
0-5	17	18.54
5-10	75	74.69
10-15	98	110.56
15-20	120	127.40
20-25	129	128.26
25-30	116	117.40
30-35	100	99.59
35-40	74	79.16
40-45	63	59.36
45-50	53	42.19
50-55	34	28.52
55-60	23	18.39
60-65	28	25.91
	930	930
A		1.8112
B		28.848
γ		1.6601
Chi-square		7.709

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